FLIGHT
The AIRCRAFT ENGINEER & AIRSHIPS

First Aero Weekly in the World.

Founder and Editor : STANLEY SPOONER

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport

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DIARY OF FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in the following list:

May 11	**Lecture, "Experimental Flying," by Maj. M. E. A. Wright, before I.Ae.E.**
June 23	**Grosvenor Challenge Cup, Lympne**
June 25–30	**International Air Congress, London**
June 30	**R.A.F. Aerial Pageant**
July	**Air Race for King's Cup**
July 20	**Gothenburg Exhibition**
Aug. 1	**Entries close from British Competitors for Schneider Cup**
Aug. 3–14	**Rhön Gliding Competition**
Aug. 6	**Aerial Derby**
Aug. 6–27	**French Gliding Competition, near Cherbourg**
Aug. 8–12	**F.I.A. Conference, Gothenburg.**
Sept. 23	**Gordon Bennett Balloon Race, Belgium**
Sept. 28	**Schneider Cup Seaplane Race at Cowes**
Dec. 1	**Entries close for French Aero Engine Competition**
1924	
Mar. 1	**French Aero Engine Competition.**

INDEX FOR VOL. XIV.

The Index for Vol. XIV of FLIGHT (January to December, 1922) is now ready, and can be obtained from the Publishers, 36, Great Queen Street, Kingsway, W.C. 2. Price 1s. per copy (1s. 1d. post free).

EDITORIAL COMMENT.

REFERENCE has already been made in these columns to the great amount of good which the very generous offer of a £500 Prize by the Under-Secretary of State for Air, His Grace the Duke of Sutherland, should do to the progress of economical flying. The experiments carried out to date, and theoretical considerations based upon known data, indicate that the light 'plane of the future may have an engine of 10 to 15 h.p. (actual), a maximum speed of over 60 m.p.h., a cruising speed of between 40 and 50 m.p.h., and a landing speed of somewhere in the neighbourhood of 30 or 35 m.p.h. The question that naturally arises is "What use will such a machine be?"

Future of the Light 'Plane

In the first place, the assumption must be made that engines of this power can be made very reliable. That is the very first consideration. At present there are no data upon which to base an opinion as to the possibilities of producing a reliable engine of sufficiently light weight. From considerations of cost it seems probable that we shall have to carry out our pioneer work with motor-cycle engines, adapted, if necessary, for the special conditions. No firm could begin to develop and market at a sufficiently low price a special aircraft or light 'plane engine of the right type unless there was some prospect of reasonably large orders. At present this prospect does not exist, although we have not the slightest doubt that, once preliminary experiments have been made, proof of the enormous possibilities of the light 'plane will be forthcoming. The difficulty is to make a start.

There are in existence, and in daily use at the present time, a number of fairly efficient air-cooled engines of the motor-cycle type, which at any rate give

promise of being useful when fitted in light 'planes. We still have to demonstrate by actual experience that these engines have the reliability required, and certain other features of greater importance in aircraft than on a motor-cycle. For instance, the question of vibration enters into the problem to a greater extent than on the road. The flat twin will probably be chosen for preference, owing to its good mechanical balance. The Vee type is something of an unknown quantity in two-cylinder units as far as the air is concerned, although there is reason to believe that the somewhat imperfect balance need not seriously interfere with its use in a light 'plane. If the Vee type be found sufficiently smooth, the choice afforded the designer of light 'planes will be considerably increased, as a large number of Vee twin-cylinder engines is on the market.

The chief consideration at the moment is that we shall have to utilise existing cycle engines, for our preliminary experiments at any rate. Consequently we commence this week a series of articles dealing with cycle engines of a capacity in the neighbourhood of, but not exceeding, 750 c.c. capacity, and which appear to be suitable for experimental purposes. The limited capacity of 750 has been adopted owing to considerations of the Sutherland Prize, but otherwise we are not at all certain that the light 'plane of the future will necessarily be limited to this capacity.

For a machine to be of any practical use, it should be able to make reasonably good headway against winds of average strength, and it has not yet been demonstrated that engines of 750 c.c. capacity are powerful enough to do this. We are quite prepared to find that with efficient aerodynamic design this size of engine is sufficient, but this still remains to be proved. For cruising around in the neighbourhood of an aerodrome the smaller cycle engines would probably be powerful enough, but for cross-country work a reasonable reserve will probably be necessary. There can, however, be no doubt that several types of motor-cycle engines are capable of giving us the initial practical experience required, and enable us to form a very sound basis upon which to judge the capabilities of light 'planes.

Let us assume, for the moment, that it has been proved that light engines of suitable power are available, and are sufficiently reliable to make cross-country flying a practical proposition. Is there then likely to be a demand for such machines? We are convinced that there is every probability that the demand will be very large. It should be possible to design these machines with a great amount of inherent stability, so that a minimum of skill is required to fly them. Landing, as they will, at only slightly over 30 m.p.h. the danger in case of a crash should be relatively small. If anything goes wrong in a machine landing at 60 m.p.h., or more—if the pilot makes a slight error, the consequences are likely to be serious. At 30 m.p.h. not only will the shock be comparatively gentle, but the low speed gives the pilot more time to think and act. Thus it seems that probably the greatest difficulty will be, not economy, nor performance as regards cruising speed, but the question of taking off. These light 'planes will have a relatively high power loading, and consequently the rate of climb will be somewhat indifferent. At the same time, it will occur at a very low speed, and it would seem probable that a pilot would have a very good chance of turning back into the aerodrome, should his engine fail just as he is taking off. If a sufficiently good take-off can be attained, we see no great difficulty in providing the other desiderata. If machines are designed—as they certainly ought to be—with folding or easily dismantled wings, they will take up very little space in a shed, and a number of machines could be accommodated in an ordinary hangar. Thus at the London aerodromes (to take the case of the London district) there should be ample and relatively cheap accommodation at Croydon, Cricklewood, Stag Lane and Hendon, the choice depending on which part of London the owners resided. At all these places, too, there would be facilities for repairs and overhaul, and it might be expected that clubs would be formed. The natural sequel would be the holding of races for light 'planes, and it seems likely that a very great number of enthusiasts would be attracted who could not otherwise afford to take up practical flying. Thus from the sporting point of view, the light 'plane will almost certainly become popular.

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Other Uses

The possibilities of the light 'plane are not, however, confined to sporting aviation. One purpose which immediately suggests itself is instruction in flying. These light 'planes will cost, when produced in large quantities, something between £100 and £200, according to type. Consequently, it will be possible to train a pilot for very much less than it now costs, not to mention the greater security resulting from using slow machines. This points to a large field of usefulness for the light 'planes, not only in civil life, but also in the R.A.F., where a preliminary, or elementary, course in flying might well be instituted, starting with gliders and then proceeding to light 'planes, and then, by easy stages, to the high-speed scout. In this way the R.A.F. should save a great deal of money on crashes, as the preliminary training should suffice to find out the pupils who were likely to become good pilots, and those never likely to have the necessary "hands."

Apart from school work, it appears likely that the light 'plane will form a very useful step between wind tunnel work and full scale experiments. Thus one can imagine certain research work—for instance on a new type of wing—instituted in the wind channel. The results are promising, but there is still some doubt as to "scale effect." The wing is tested in free flight on a light 'plane, and the scale effect is determined. Not only this, but a number of other characteristics about which the channel tests have still left some doubt.

Another field for free flight research, and one which cannot very well be carried out in the wind tunnel, is controllability at or even beyond the stalling angle. At present this is a very costly business, and there does not seem to be any reason to doubt that the necessary information could be obtained by the use of light 'planes. Free flight tests on slotted wings of the Handley Page type, or wing flaps of the Fairey type, might also be carried out in this manner, and altogether it would appear that the light 'plane might form the "missing link" between the channel and the large machine—providing information which the former cannot give, and at a cost not very much higher than the cost of a series of tests in the channel. One fuselage and engine could probably be used for testing a great number of wings, and it is not inconceivable that firms who do not at present run their own wind channel would do better to build a light 'plane for their experiments.

AIRSHIP PROGRESS IN AMERICA

ALTHOUGH the U.S. of America, and American aviation in particular, received two very heavy blows in the loss of their British-built rigid airship ZR2, and later in the destruction of the newly acquired Italian semi-rigid airship "Roma," it cannot be said that the development of the lighter-than-air side of American aeronautics has been allowed to suffer in consequence. Not only is the construction of ZR1, the rigid airship designed by the U.S. Navy, making good progress at the Lakehurst and Akron "yards," but contracts for various other smaller types of airships have been, or are being, fulfilled.

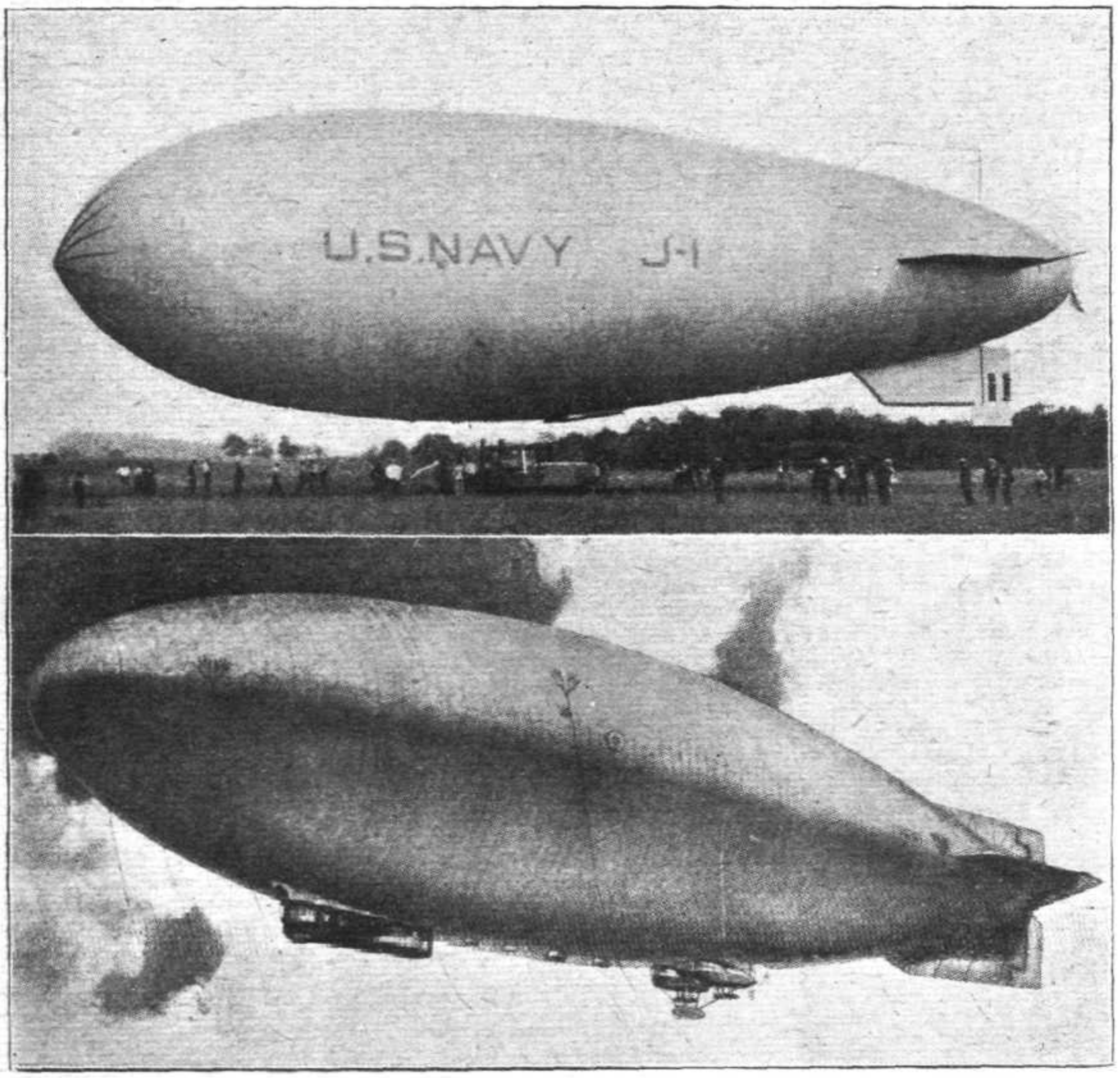
For instance, the Goodyear Tyre and Rubber Co., of Akron, Ohio, recently received an order for five non-rigid and one semi-rigid airships from the U.S. Army, whilst, in addition, there were three other non-rigids in hand for the U.S. Navy.

In building the semi-rigid airship—its first—America will have the aid of Umberto Nobile, the distinguished and expects to get back in his own factory by the time construction is under way, so that he can supervise that work.

The projected American ship is also called a "mother" airship, since it is intended to be used as an aeroplane carrier. Its great gas bag will have a capacity of 750,000 cubic feet. Hitherto the largest non-rigid ships built in the United States have had a capacity of 180,000 cubic feet of gas, though some 203,000 cubic feet helium ships will be built very shortly.

With a maximum speed of 70 m.p.h., it will have a flying range of 1,630 miles, and a cruising radius of more than 4,000 miles at 44 m.p.h., and it will be able to pick up and release aeroplanes while flying at full speed.

The distinguishing feature of the semi-rigid ship is its metal keel running the length of the 300-ft. gas bag. The two-power cars containing engines and propellers and the navigator's car are to be suspended from this metal keel,



Two Goodyear Dirigibles: At the top the new J-1 type of non-rigid built for the U.S. Navy. Below, a drawing of the large semi-rigid now under construction for the U.S. Army.

Italian engineer and co-inventor of the semi-rigid type of dirigibles.

Engineer Nobile, to give him his official title, is Managing Director of the Italian Government aircraft factory near Rome, and visited America on a three months' leave of absence, to assist in the calculation for building this new semi-rigid airship for the United States Army at the Goodyear aeronautic factory.

The semi-rigid type of airship originated in Italy, just as the rigid or Zeppelin type originated in Germany, and Engineer Nobile is the foremost authority on this type of ship in Italy—if not in the world.

In engaging him to come to America, the Goodyear Tyre and Rubber Co. wanted to take every possible precaution of safety. Engineer Nobile personally calculated all the stresses that a semi-rigid is subject to during flight or when moored out in the open.

Engineer Nobile has just completed the designs for a new semi-rigid ship for the Italian Government, only slightly smaller than the one being built for the American Army, while the huge gas bag will be attached to it at intervals of 10 ft. The envelope will be practically a single bag, and divided by a diaphragm lengthwise through the middle. In cross-section it will bear the shape of an inverted heart, placed over the metal keel. The latter terminates in a cone-shaped structure at each end, for the purpose of maintaining the shape of the envelope.

It will be one of the largest semi-rigid ships in the world when it is completed, the only larger American airship being the ZR1, which will be 630 ft. long, and have a series of gas compartments or ballonets, with a total gas capacity of about $2\frac{1}{4}$ million feet.

Both airships are to be completed next autumn, and will enable the American Government to test out the relative usefulness of the two types.

The assembling of a new-type "J" non-rigid airship for the United States Navy was completed recently by the Goodyear Tyre and Rubber Co. at Wingfoot Lake Air Station, Akron, Ohio. Of navy design, adapted from former navy types, the new ship embodies several features now

coming to be recognised as standard equipment for this class of non-rigid airships.

Two union motors of 120 h.p. each are used, mounted on Wingfoot type outriggers, after a plan successfully carried out on tests on other ships last year. Radio equipment is carried and a full supply of modern type parachutes, one for each member of the crew.

The new "J" Type has an envelope of 173,000 cubic feet capacity, 168 ft. long and 45 ft. in diameter, with a speed of 45 to 60 m.p.h., giving a cruising radius of from 1,000 to 1,300 miles with full military load. A crew of seven persons is carried, consisting of the pilot, coxswain, radio operator, and observers. Reconnaissance work along the coast and between ships at sea and the spotting of submarines is expected to be the chief work of this new airship "J-1."

LONDON TERMINAL AERODROME

Monday evening, April 16

PASSENGER traffic continues to grow, especially on the London-Paris route, and Handley Page Transport are making strenuous efforts to deal with the big influx. They are running their machines there and back each day, and have during the week carried a tremendous number of passengers in comparison to the number of machines employed on the route. The Air Union continues to send large numbers of machines between London and Paris, and their fleet of motor-vans has had to be considerably augmented.

Final arrangements have now been made for the running of what might be termed the North European Trunk Airway, a satisfactory agreement having been arrived at between the Daimler Airway, the Royal Dutch Air Service, the Aero-Lloyd of Germany and the Danish Aviation Co. The full-time-table will be put into operation on April 30, and will mean three services a day between London and Amsterdam in each direction at 8.30 a.m., 9.30 a.m. and 12.25 p.m. respectively from London. The 8.30 a.m. will be one of the machines of the Royal Dutch Air Service which will stop at Amsterdam, while the 9.30 a.m. will be a Daimler with a through connection at Amsterdam with the German machines to Berlin. Every Monday the 9.30 a.m. Daimler machine will run right through to Berlin, returning to London the following day, while a German machine will leave Berlin each Monday morning and arrive in London the same evening, returning to Berlin every Tuesday. The 12.25 p.m. will also be a Daimler machine, and will get passengers into Amsterdam in time to catch the night train to Copenhagen, which will connect with a daily air service from Hamburg to Copenhagen, leaving the former place at 9 a.m. and arriving in Copenhagen at 11 a.m. At present there is no through connection to Berlin, but the Manchester time-table has been so re-arranged that in the opposite direction, *i.e.*, from Berlin to Manchester, there will be a definite through connection. Passengers can leave Berlin any morning at 8.30 a.m., arriving in London at 5.55 p.m., and catch the 6.15 p.m. Manchester "air express," which is scheduled to alight at Manchester at 8.15 p.m. The through fare from London to Berlin has been fixed at £6 10*s*., and from Manchester to Berlin £8 15*s*. The only section of the route on which freight will be carried is the London-Amsterdam portion. On the rest of this airway a purely passenger traffic is being catered for. It will also be possible for passengers wishing to travel through to Moscow to catch the night train at Berlin for Könisberg, and travel from thence by air to Moscow, arriving at the latter place the day following the departure from London.

Film Drama at the 'Drome

THE aerodrome staff were intensely interested in the performance of some cinema people who came down during the week in order to film certain portions of a movie drama which had to do with the air. The Instone Air Line had placed one of its De Havilland machines at the disposal of the producer, and an interested audience witnessed the heroine's escape by air from the pursuit of the villain. The players had a busy time, and went through their parts no fewer than eight times, the producer shouting himself hoarse with instructions in the meantime, and many of the people on the aerodrome immediately relinquished all their ambitions of becoming film stars.

Major E. L. Foot, who has since the commencement of civil aviation been associated with the Handley Page Transport, is leaving the firm to take up a position as test pilot with the Bristol Aviation Co. Here he will have an opportunity of flying one of the fastest machines yet produced in England, and the aerodrome will still, it is hoped, have many visits from him on the occasion of race meetings.

Mr. Youell, who has for the past twelve months been acting as joy-ride pilot for the Surrey Flying Services, has now joined the Daimler Airway in place of Mr. Herne, who is leaving for America to join the little band of "sky-writers" out there.

A Honeymoon Air Special

CONSIDERABLE interest was caused during the week by a "special," booked through the Daimler Airway, which was engaged to fly a honeymoon couple from Gidea Park to Hindhead. The machine was to have returned to Croydon after its flight, and the night-lights were burning well into the evening in anticipation of its return. It was not, in fact, until after much telephoning that it was finally learned that the pilot had decided to stay the night at Churt, where he had alighted at the end of his flight.

The K.L.M. have spent a busy time during the winter improving their Fokker monoplanes. Instead of sending these back to the factory they have employed their personnel, which would otherwise have been considerably reduced during the winter, to make these alterations. The cabin has been appreciably enlarged, and, instead of the heavy upholstered chairs, wicker-chairs conforming more to general airway practice have been installed, and the machines can now accommodate six passengers with far greater comfort and more room per passenger than the previous five which they were arranged for.

The Royal Tournament

THE Royal Tournament will open at Olympia on May 24 and will close on June 9. As usual, a very attractive programme on new lines has been arranged, and it is hoped to secure a good surplus for the Service charities. The pageant this year will depict the rise and development of the Scottish clans, introducing the great chieftains of history and culminating in the march of the present-day clans as represented by the Highland regiments headed by their pipers.

A display that will be especially interesting is to be given by the Air Defence Brigade, and will show an airship in flight attacked by aeroplanes. We understand this will be a wonderfully clever piece of staging, and if one doubts the ability to place a small airship in Olympia it can be recalled that the Navy put a "Q" ship in the arena last year.

The cavalry will be represented in the displays by the 12th Royal Lancers, and the artillery by the famous old 3rd Battery. The Army will give a physical training display on fresh lines, and the R.A.S.C. demonstrate riding and driving. The Royal Navy will have gun teams in the arena.

The jumping competitions will be for the King's Cup and the Prince of Wales's new Cup, while the skill-at-arms championships of the three Services will be fought out between the elected district champions.

W for Wright

UNDER the International Air Navigation Convention of 1919 American (U.S.) civil aircraft are allotted the nationality letter N. America has not yet ratified the I.A.C., and in the meantime Norway, which has neither signed nor ratified the Convention, has adopted the same letter. Our American contemporary *Aviation* suggests that inasmuch as the letter W is one of the radio call letters allotted to the United States (N is also another), it would be a gracious act of homage to the Wright brothers if the United States adopted this letter as its nationality mark for aircraft.

Aero Golfing Society

THE Spring Meeting of the Aero Golfing Society will be held at the Hadleigh Wood Golf Club, near Barnet, on Thursday, April 26, 1923, when the competition for the Society's Spring Challenge Cup, presented by the proprietors of FLIGHT, will be held. Entries should be sent to Mr. Harold E. Perrin, Royal Aero Club, 3, Clifford Street, London, W. 1, by Monday, April 23.

"FLIGHT" GLIDER DESIGNING COMPETITION

Identity of Successful Competitors

As announced in last week's issue of FLIGHT, the envelopes containing the names and addresses of competitors in our designing competition were not opened until Friday of last week—by which time FLIGHT was distributed and in the hands of our readers. Consequently, neither the judges nor the Editor knew who were the authors of the winning designs, and the judging and final award were not, therefore, prejudiced in any way.

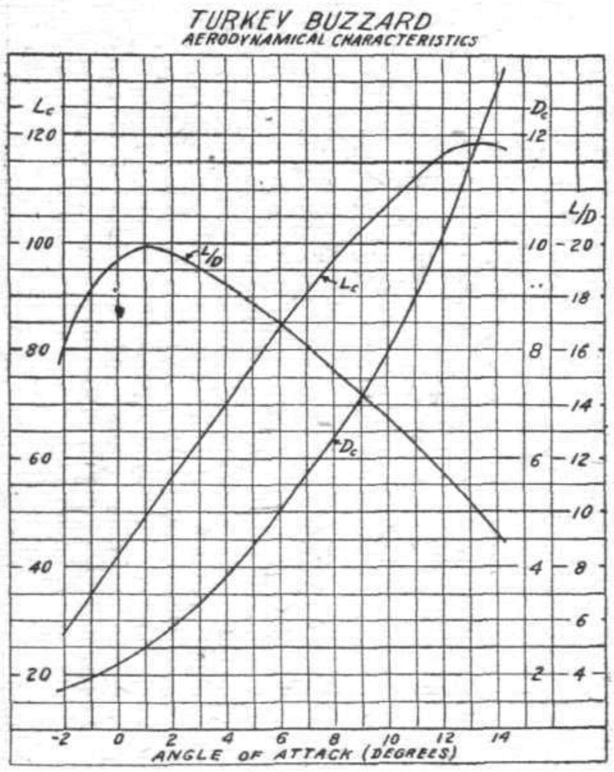
The announcement of the awards having been made, the envelopes were opened and the identity of the winning designers ascertained.

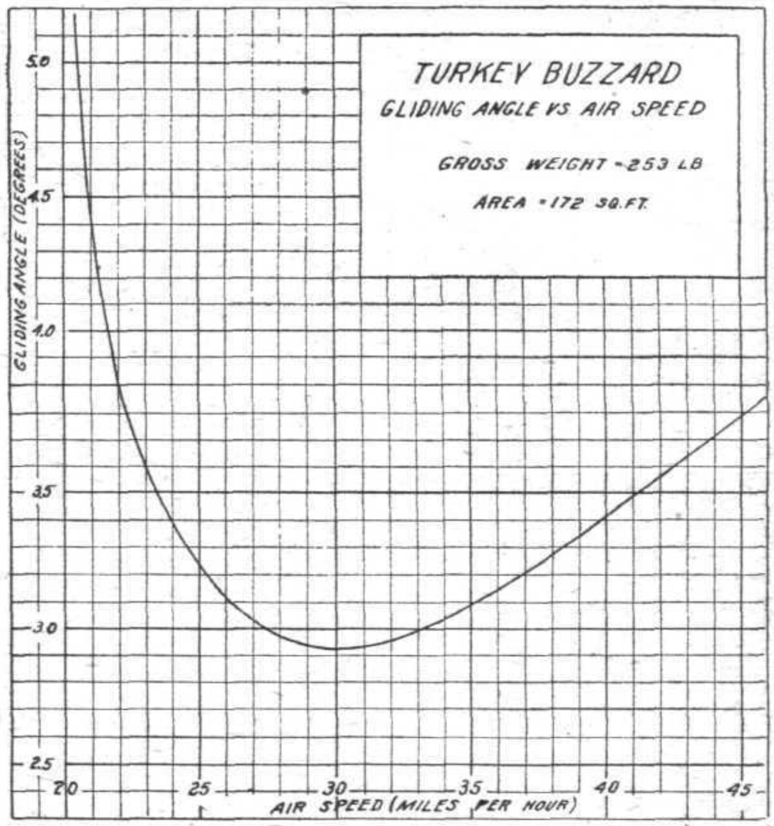
"Turkey Buzzard" was designed by Messrs. Roy G. Miller and D. T. Brown, of the Naval Aircraft Factory, Philadelphia, Pa., U.S.A., and

"K_L" by Mr. R. J. Ashfield of 180a, Cheltenham Rd., Bristol.

Cheques have been dispatched to the winners, and we take this opportunity of thanking all who have participated in the competition for the great deal of trouble taken and the amount of work put into most of the designs submitted. When we have finished publication of the drawings of the winning designs we hope to publish drawings of some of the more promising but unsuccessful designs.

"TURKEY BUZZARD"





"TURKEY BUZZARD": Aerodynamic characteristics and gliding angles.

ANGLE OF ATTACK	GÖTTINGEN NO.426						SLOANE						TOTALS			
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0	.25	.28	38.6	.013	.0108	1.490	.095	.102	3.47	.005	.00429	.146	42.07	1.636	2.1354	19.7
2	.32	.36	49.7	.019	.0162	2.235	.19	.203	6.90	.008	.00687	.234	56.60	2.469	2.9684	19.1
4	.39	.44	60.7	.025	.0210	2.90	.27	.292	9.93	.013	.0112	.381	70.63	3.281	3.7804	18.7
6	.46	.52	71.7	.033	.0276	3.81	.34	.370	12.60	.022	.0192	.852	84.30	4.662	5.1614	16.4
8	.53	.60	82.8	.043	.0352	4.85	.40	.440	14.97	.033	.0288	.978	97.77	5.828	6.3274	15.4
10	.59	.66	91.0	.054	.0438	6.05	.45	.490	16.67	.050	.0422	1.434	107.67	7.484	7.9834	13.5
12	.64	.72	99.3	.068	.0552	7.61	.50	.516	17.55	.073	.0640	2.18	116.85	9.79	10.2894	11.4
14	.64	.72	99.3	.084	.0682	9.40	.53	.546	18.57	.102	.0867	2.95	117.87	12.35	12.8494	9.2

"TURKEY BUZZARD": Scale corrections, etc., for the aerodynamic characteristics of the wing.

THE general arrangement drawings of "Turkey Buzzard" were published last week, as were also those of "K_L". In the present issue we publish the performance calculations for "Turkey Buzzard," and the constructional drawings of the fuselage. In subsequent issues it is proposed to give the constructional drawings of wings, tail, undercarriage, etc., and when all have been published we hope to commence the detail drawings of "K_L."

Performance Calculations

The following performance calculations accompanied the design for "Turkey Buzzard":—

The Goettingen 426 aerofoil is used over the middle 14 ft. of the span. (The thick section is carried one rib station beyond the parallel portion of the wing to relieve the abrupt bend in the flanges.)

Chord of parallel wing = 75 ins.

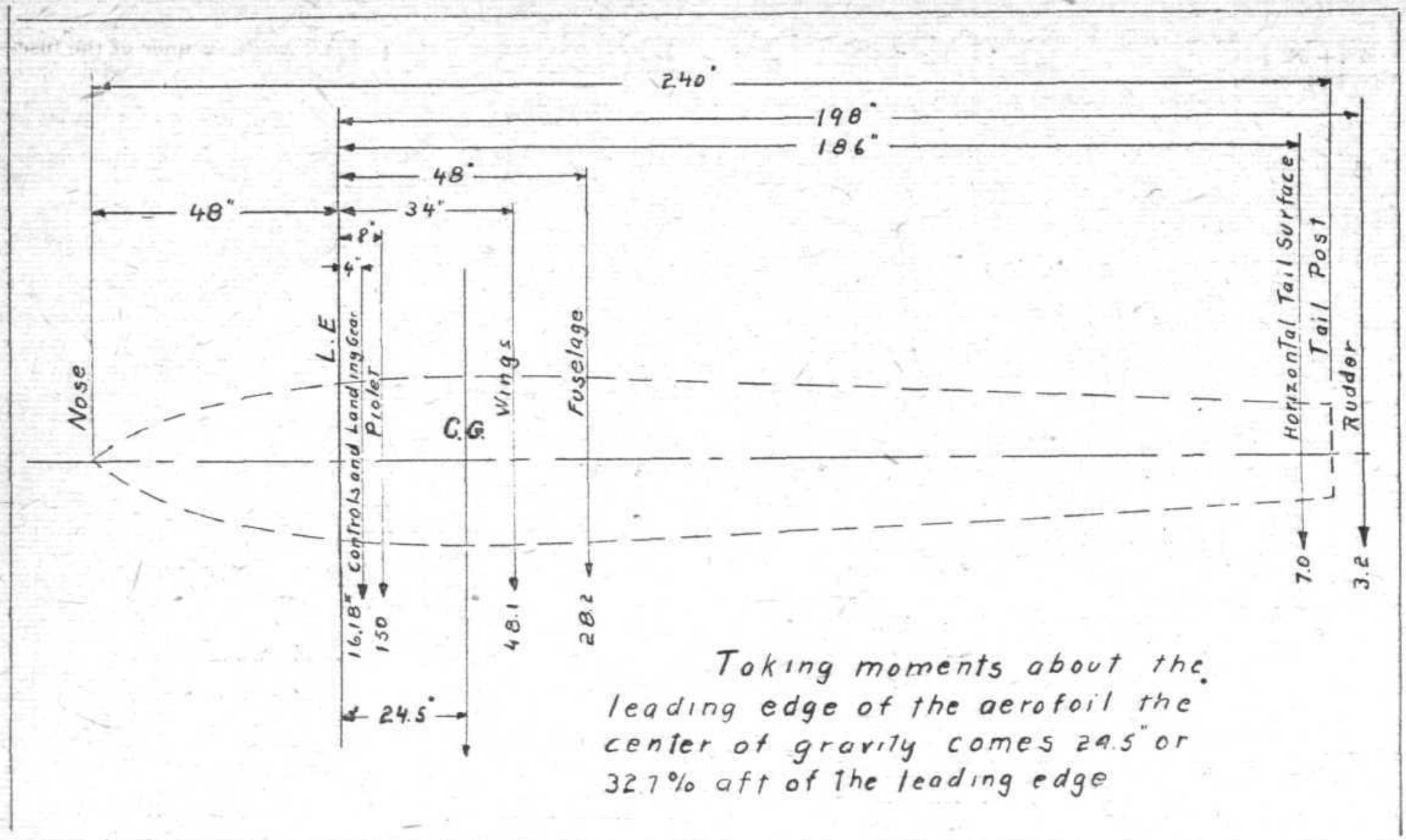
Chord of wing at 7 ft. from the centre = 72 inches.

$$\text{Area of Goettingen } 426 = \frac{75 \times 12}{12} + \frac{75 + 72}{12} = 87 \text{ sq. ft.}$$

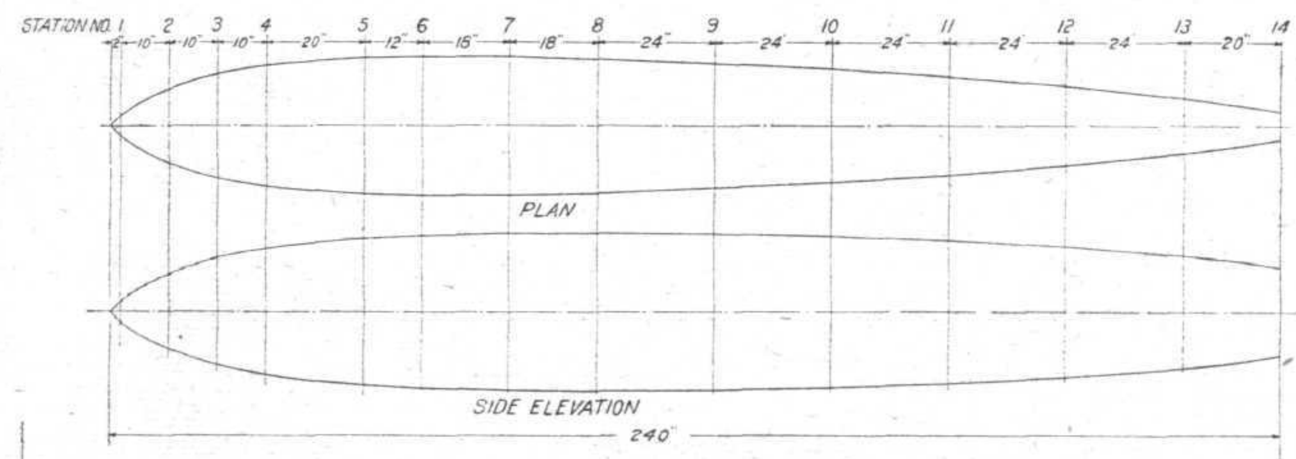
The balance of the wing is tapered down to the Sloane curve at 1 ft. from the tip.

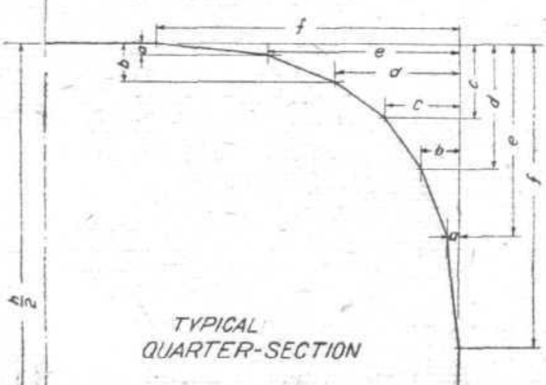
Chord of Sloane curve = 48 ins.

Area of tapered portion = 172 — 87 = 85 sq. ft.



"TURKEY BUZZARD": Balance diagram. By taking moments about the leading edge, the c.g. of the machine is found to fall at 24·5 ins. aft of the leading edge.





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2	12	7.45	7.56	.21	.69	1.34	2.24	3.46	5.46
3	22	10.63	10.98	.30	.99	1.92	3.21	4.93	7.79
4	32	12.33	12.91	.35	1.13	2.21	3.71	5.72	9.04
5	52	13.83	14.97	.39	1.29	2.49	4.17	6.41	10.14
6	64	14.11	15.53	.40	1.30	2.55	4.25	6.55	10.34
7	82	14.08	15.99	.40	1.30	2.54	4.24	6.53	10.31
8	100	13.62	16.06	.38	1.26	2.46	4.10	6.32	9.98
9	124	12.68	15.85	.36	1.17	2.29	3.82	5.88	9.29
10	148	11.63	15.36	.33	1.07	2.10	3.50	5.39	8.52
11	172	10.13	14.61	.28	.93	1.83	3.05	4.69	7.42
12	196	8.14	13.36	.23	.75	1.47	2.45	3.77	5.97
13	220	5.62	11.62	.16	.52	1.01	1.69	2.61	4.12
14	240	2.82	9.00	.08	.26	.51	.85	1.31	2.07

TURKEY BUZZARD
FUSELAGE LINES

"TURKEY BUZZARD"; Lines of the fuselage, with dimensions for rounded corners. In building it will be found an advantage to draw out, to full scale, the sections at the various "stations," as the size and shape of 3-ply formers and correct placing of stringers can then more easily be determined.

$\frac{72}{48+72} \times 85 = 51$ sq. ft. of tapered portion to be taken as Goettingen 426.

$87 + 51 = 138$ sq. ft., total Goettingen 426.

$\frac{48}{48+72} \times 85 = 34$ sq. ft., area of Sloane curve.

The equivalent aspect ratio of the wing will be based upon the chord at the tip. Area = 172 sq. ft.; chord at the tip = 4 ft.; aspect ratio $= \frac{172}{4^2} = 10{\cdot}7$.

[The more usual procedure is to take the *mean chord* and divide this into the span. If this is done the aspect ratio works out at about 6·25, which is considerably below the figure of 10·7 assumed. However, the designers were, apparently, aware that this might be open to criticism, as they continue.]

To offset the possibility that the assumption made above might lead to estimates that are too optimistic no correction will be made for the shape of the wing tip. Corrections for aspect ratio will be made according to R. and M. 450. Since both aerofoils under consideration were tested at very high values of LV ratio no correction will be made for scale.

Parasite Resistance

1. Lift struts: $\frac{7}{8}$ in. diameter by 73 ins. long; frontal area of 4 struts $= \frac{7 \times 73 \times 4}{8 \times 144} = 1{\cdot}78$ sq. ft.; resistance coefficient = ·04 (absolute) for faired tube

$$\cdot 04 \times 1{\cdot}78 = \cdot 071$$

2. Centre section struts: $\frac{1}{2}$ in. diameter by 18 ins. long; frontal area of four struts $= \frac{18 \times 4}{2 \times 144} = \cdot 25$ sq. ft.; resistance coefficient = ·04

$$\cdot 04 \times \cdot 25 = \cdot 010$$

3. External wires: $\frac{5}{64}$ in. cable by 24 ins. long; frontal area of four cables $= \frac{5 \times 24 \times 4}{64 \times 144} = \cdot 00868$ sq. ft.; resistance coefficient = ·60

$$\cdot 60 \times \cdot 00868 = \cdot 0052.$$

4. Fuselage: Frontal area = 4 sq. ft.; resistance coefficient for dirigible form = ·0343; the resistance of the fuselage will be assumed to be $1\frac{1}{2}$ times that of the dirigible form

$$\cdot 0343 \times 1{\cdot}5 \times 4 = \cdot 2058.$$

5. Landing gear: Exposed portion of torque tube $= \frac{46 \times 1{\cdot}75}{144} = \cdot 559$ sq. ft.; resistance coefficient for faired tube = ·040

$$\cdot 040 \times \cdot 559 = \cdot 0224.$$

Skids: 1 in. by 20 ins.; frontal area of three skids $= \frac{20 \times 3}{144} = \cdot 417$ sq. ft.; resistance coefficient = ·060

$$\cdot 060 \times \cdot 417 = \cdot 025.$$

Total for landing gear: ·0224 + ·025 = ·0474.

6. Tail surfaces: Area = 32 sq. ft.; min. drag coefficient for Goettingen 410 = ·005

$$\cdot 005 \times 32 = \cdot 160.$$

Summation of parasite resistance:

·071 + ·010 + ·0052 + ·2058 + ·0474 + ·160 = ·4994.

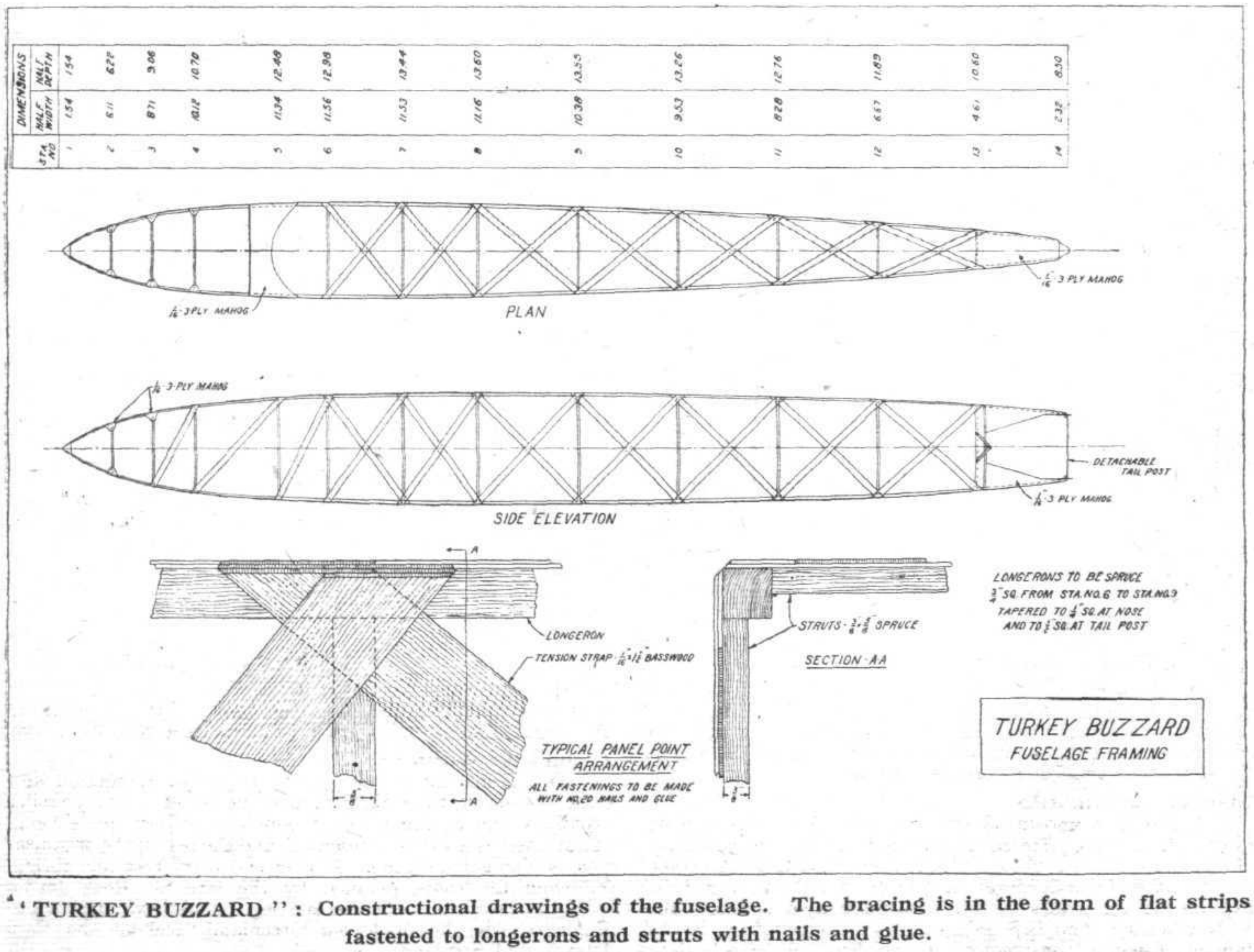
Weight Estimate

Detailed weight statement based on the following unit weights:—

Spruce	·0156 lb./cu. in.
Basswood	·0156 ,,
Hickory	·0289 ,,
Steel	·2841 ,,
$\frac{1}{16}$-in. 3-ply mahogany	·20 lb./sq. ft.
Fabric	·03 ,,

Wing Group

	lbs.	
Beams	13·5	
Ribs	6·0	
Drag bracing	3·0	
Fittings	2·0	
Covering	10·4	
Compression ribs	1·2	
Aileron beams	2·0	
,, hinges	1·0	
Lift struts	9·0	
		48·1



"TURKEY BUZZARD": Constructional drawings of the fuselage. The bracing is in the form of flat strips fastened to longerons and struts with nails and glue.

Fuselage		lbs.
Struts	2·45	
Longerons	8·4	
Tension straps	3·85	
Fairing strips	2·1	
Plywood fairing seat and floor ..	3·6	
Covering	3·8	
Fittings (wing and tail plane) ..	2·0	
Glue and nails	2·0	
		28·2
Horizontal Tail Surfaces		
Ribs..	1·56	
Beams	3·50	
Special rib	·32	
Covering	1·32	
Nails and glue	·30	
		7·00
Rudder: Weight is proportional to area of horizontal surface ..		3.2
Landing Gear		
Torque tube	6·0	
Skids (three)	6·8	
Horns, fittings and cord	2·0	
		14·8
Controls		
Stick	·55	
Pulleys	·83	
		1·38
Total dead weight		102·7 lbs.

The stress analysis was based on an original dead weight estimate of 150 lbs., which was purposely made high in order to ensure an ample factor of safety. Using the dead weight as calculated above and the live load of 150 lbs. kept the same, the low speed load factor will be 4·8 instead of 4, and in the diving condition will be 3·7 instead of 3·08.

CONSTRUCTIONAL DETAILS

Up to the present, we have, except where otherwise indicated, quoted the designers of "Turkey Buzzard." When, however, we come to constructional details, the designers give no information other than that contained in the drawings, themselves, and the following notes are our own comments and explanations.

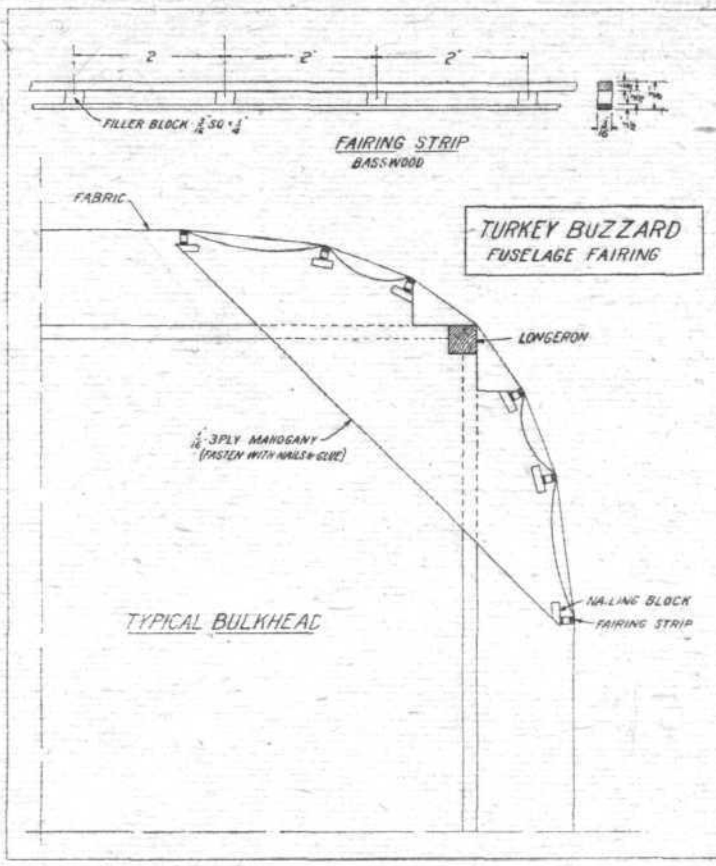
The Fuselage

The fuselage of "Turkey Buzzard" is an adaption of a streamline airship shape, and is fundamentally a rectangular section with the corners rounded off. One of the accompanying sets of drawings shows the lines of the fuselage, with "stations" marked, while the next illustration shows the general construction.

Briefly the fuselage consists of four spruce longerons, $\frac{3}{4}$ in. square from station No. 6 to station No. 9, tapered to $\frac{1}{4}$ in. square at nose and $\frac{1}{2}$ in. square at stern post. The longerons are connected by vertical and horizontal struts of spruce, of rectangular section measuring $\frac{3}{8}$ in. by $\frac{5}{8}$ in. The fuselage bracing is in the form of flat basswood strips $\frac{1}{16}$ in. thick and $1\frac{1}{2}$ in. wide, tacked (with No. 20 nails) and glued to longerons and struts. The corners are chamfered off as shown in the drawings. The last bay is covered with $\frac{1}{16}$-in. 3-ply mahogany. The front portion of the fuselage is shown without diagonal bracing, probably to save work, but it might be advisable to continue the strip bracing over this portion.

The manner of building-up the streamline structure which fairs off the fuselage is shown in one of the smaller drawings. The stringers, as shown, are basswood double strips, separated by distance pieces or filler blocks. The outer strip is $\frac{1}{8}$ in. by $\frac{3}{16}$ in. and the inner $\frac{3}{16}$ in. by $\frac{1}{16}$ in. The space between the two strips is $\frac{3}{16}$ in., and the filler blocks, spaced 2 ins. apart, are $\frac{3}{16}$ in. square by $\frac{1}{4}$ in. long. It would appear that this double strip arrangement is an unnecessary refinement, and that the strips might just as well be made solid, $\frac{3}{16}$ in. thick by $\frac{3}{8}$ in. wide.

The stringers are housed in notches in the $\frac{1}{16}$-in. 3-ply mahogany corner plates, and are secured to them by small nailing blocks as shown. The corner plates themselves are tacked and glued to the horizontal and vertical struts. The fuselage is finally covered with fabric. The reason for cutting away the 3-ply corner plates as shown is, of course, that the fabric has a tendency to sag between stringers, and if the



"TURKEY BUZZARD": This drawing shows the construction of longitudinal fuselage stringers, and method of attaching them, by 3-ply formers, to corners of fuselage. We suggest extending the formers down the sides, and placing a few stringers on them to keep the fabric from sagging.

corner plates, or formers, came right out to the fabric they would form ridges in it.

We frankly confess that we do not like the way the fabric is left free to flap about on the sides, and to a smaller extent on top and bottom, of the fuselage, and we should advise the use of formers on the sides and a few stringers, similar to those indicated, placed down the sides. When pulled fairly tight longitudinally the fabric will sag on the sides, and instead of a good streamline form, the fuselage sides would have a hollow which might easily make it worse, aerodynamically, than a plain rectangular section flat-sided body. However, a few stringers, as indicated, should remedy this defect.

(To be continued.)

A Portuguese Attempt?

FROM Lisbon it is reported that Coutinho and Cabral, the two Portuguese aviators who flew from Lisbon to South America in a Fairey seaplane with Rolls-Royce engine, are contemplating a flight around the world, and are to receive the support of the Portuguese Government.

Sikorsky in America

A COMPANY known as the Sikorsky Aero Engineering Corporation was chartered on March 5 last by the Secretary of the State of New York, with a capitalisation of $200,000. The purpose of the Corporation is to build, sell and in general exploit the aeroplanes of Mr. I. I. Sikorsky's system. Mr. I. I. Sikorsky, who is President of the Corporation, is the famous Russian constructor of the first successful giant multi-motored aeroplane in the world. The other officers of the Corporation are: Mr. W. A. Bary, Treasurer; Mr. L. A. Shoumatoff, Secretary. The offices of the Corporation are temporarily located at 114, East 25th Street, New York City.

Around the World

THE preparations being made by Capt. Macmillan and Capt. Malins for their flight around the world are progressing rapidly. The machine, about which great secrecy is being maintained, is nearing completion, and the rest of the organisation is also going strong. It is intended to start this spring, following the route planned by the late Sir Ross Smith, with the exception that the last leg, from Newfoundland to England, will be made *via* Greenland, Iceland the Faro Islands and Scotland.

LIGHT 'PLANE AND GLIDER NOTES

A few more particulars are now to hand relating to the Dewoitine light 'plane with which Barbot made his flight over Toulouse, as recorded in Flight last week. According to M. Dewoitine, the machine weighs 252 kilos. (554 lbs.) "all on." The engine fitted is an Anzani two-cylindered cycle engine, with direct drive to the airscrew. On the bench the engine had turned the propeller at 1,480 r.p.m. at full throttle (corresponding, according to the Anzani power curve to approximately 9 h.p.), but during the actual flight, owing to some mistake, it was not possible for Barbot to open the throttle fully, with the consequence that the engine was only turning at between 1,300 and 1,350 r.p.m. as he was taking off. At a speed of 1,350 r.p.m. the engine should develop about 7 h.p., so that the Dewoitine may safely be assumed to have got into the air (incidentally after quite a short run) with a power loading of $\frac{554}{7} = 79 \cdot 2$ lbs./h.p. Considering that the average commercial machine carries something like 20 lbs./h.p. only, the economy of the light 'plane will be obvious. It must be admitted, however, that the commercial machine flies considerably faster.

* * *

During the actual flight, *i.e.* once he had got well into the air, Barbot throttled down to 1,200 r.p.m., at which speed the engine was giving about 5 h.p., corresponding to a power loading of about 110 lbs./h.p. The cruising speed was in the neighbourhood of 40 m.p.h., while the full speed is estimated to be about 54 m.p.h.

* * *

Excellent as are these figures, the results obtained with the "Wren," designed by Mr. W. O. Manning and built by the English Electric Co., seem to be even better, from the point of view of economy. The A.B.C. engine, a brief description of which is published elsewhere in this issue, is of 400 c.c. capacity, and is rated at 3½ h.p. At a speed of 4,500 r.p.m. the power is slightly more than 7 h.p., and as the "Wren" weighs approximately 360 lbs. "all on," the full-power loading is 51·5 lbs./h.p. At no time was the engine opened out fully, and actually the machine must have taken off with the engine developing between 4 and 5 h.p., corresponding to a power loading of about 80 lbs./h.p. When flying level the engine was further throttled down, and at cruising speed the power loading must be about 100 lbs./h.p. As the machine is considerably lighter than the Dewoitine, the economy must be a good deal better, and Mr. Manning is to be congratulated upon having designed a machine which probably marks, as near as possible, an irreducible minimum in fuel consumption. At the same time the maximum speed is by no means bad, and although the machine has not yet been thoroughly tested out for this, it is expected that she will do at least 50 m.p.h.

* * *

From France it is reported that Maneyrol, winner of the *Daily Mail* £1,000 Prize at Itford last October, intends to attempt a flight from Vauville, near Cherbourg, to Jersey and back in a Peyret glider fitted with a 7 h.p. engine. The shortest distance between the mainland and Jersey is a little under 20 miles, and should be within the capacity of the Peyret. It will be interesting to see how this machine, which is a tandem monoplane, will behave as a power-driven light 'plane. As a glider it requires rather a high wind to remain aloft, and consequently it may be assumed that it will require rather more power than the "Wren" and Dewoitine. The tandem arrangement, however, lends itself admirably to the installation of a light engine, as this can be mounted in the nose of the fuselage, and the machine trimmed by simply shifting the pilot's seat back some 6 ins. or so.

* * *

The view obtained by the pilot in the Peyret is, perhaps, the best possible in any aeroplane, as he is seated behind the trailing edge of the front wing and is placed at such a height relatively to the two wings that he sees them both "edge on." The "hollow-ground" shape of the deck fairing allows him to see straight forward, and only the relatively narrow width of the fuselage obstructs his view downward. Being well aft of the front wing, the pilot should be fairly safe even in a pretty bad crash, and thus the various advantages of the tandem arrangement might outweigh the somewhat inferior aerodynamic efficiency. It seems likely that the tandem arrangement may be about on a par with the biplane as regards efficiency, since the weight and resistance of a tail plane and elevator are saved. The controllability of the Peyret, it will be remembered, is remarkable.

It is reported from Paris that Hanriots are constructing a flexible-wing light 'plane to take one of the le Rhône A.B.C. engines, the first of which was exhibited at the last Paris Aero Show and illustrated in Flight of January 11, 1923. This engine is similar to the standard 400 c.c. A.B.C. fitted to the "Wren," except that a three-to-one reduction gear is fitted. Thus a large-diameter propeller could be used, with improved propeller efficiency. No particulars are yet available relating to the Hanriot light 'plane.

* * *

This week we commence the description of the constructional details of the Flight prize-winning design "Turkey Buzzard" monoplane glider. The general arrangement drawings were published last week, from which it will have been seen that this machine is of very pleasing lines. The design is generally good, but larger control surfaces would undoubtedly have been an advantage, and we should advise any of our readers who intend to build from the published drawings to increase the size of ailerons, elevator and rudder. The Editor will always be pleased to give any advice on such alterations from the original design. The machine should be very suitable for any competitions which may be held in connection with the competition for the Sutherland Prize for light 'planes, to be held in September next, and competitors may use the same opportunity to make attempts on the Selfridge 1,000 guineas Prize for flying a distance of 50 miles in a straight line.

* * *

The other design, "K_L," is not as efficient a glider as "Turkey Buzzard," but should be very suitable for beginners and as a school machine. Details of it will be published when we have finished publication of the "Turkey Buzzard" drawings.

* * *

"Gliding and Soaring Flight" is the title of a book published by Sampson Low, Marston and Co., Ltd. The author is Mr. J. Bernard Weiss, son of the late Mr. José Weiss, who was one of the pioneers of flying in this country. The book has a preface by Mr. C. G. Grey, and an appendix by Mr. W. H. Sayers. It is in no sense a technical work on gliding, but is rather a historical account of what has been done from the earliest days up to the present time. Incidentally it gives a fuller account of the work of José Weiss than has hitherto been available, and the experiments of that early pioneer deserve to be much more widely known than they are. As Mr. Grey points out in his preface, "Mr. José Weiss—such is our English custom—is much better known in the United States as a great painter of English landscapes than he is in this country in his more important manifestation as a great pioneer of aviation." The price of "Gliding and Soaring Flight" is 5*s*. net.

* * *

Some months ago we announced that our old friend Capt. F. Warren Merriam intended to start a gliding school at Wroxall, Isle of Wight. We now learn that the number of enquiries received, and the orders placed with Merriam for the construction of gliders, is so great that he finds himself unable to cope with them single-handed, so to speak. Merriam therefore desires to get in touch with a pilot, preferably one of his old pupils, who will take an active part in the work, and at the same time invest a small amount of capital in the undertaking. It is, we believe, the intention to run a joy-riding concern in connection with the gliding school, and possibly even a complete training establishment, pupils commencing by learning to glide and then proceeding to the power-driven aeroplanes. If any of Merriam's old pupils (and there must be hundreds of them) should see this and be interested in the proposition, they are asked to communicate with Merriam, at the Whiteley Bank School of Gliding, Wroxall, Isle of Wight.

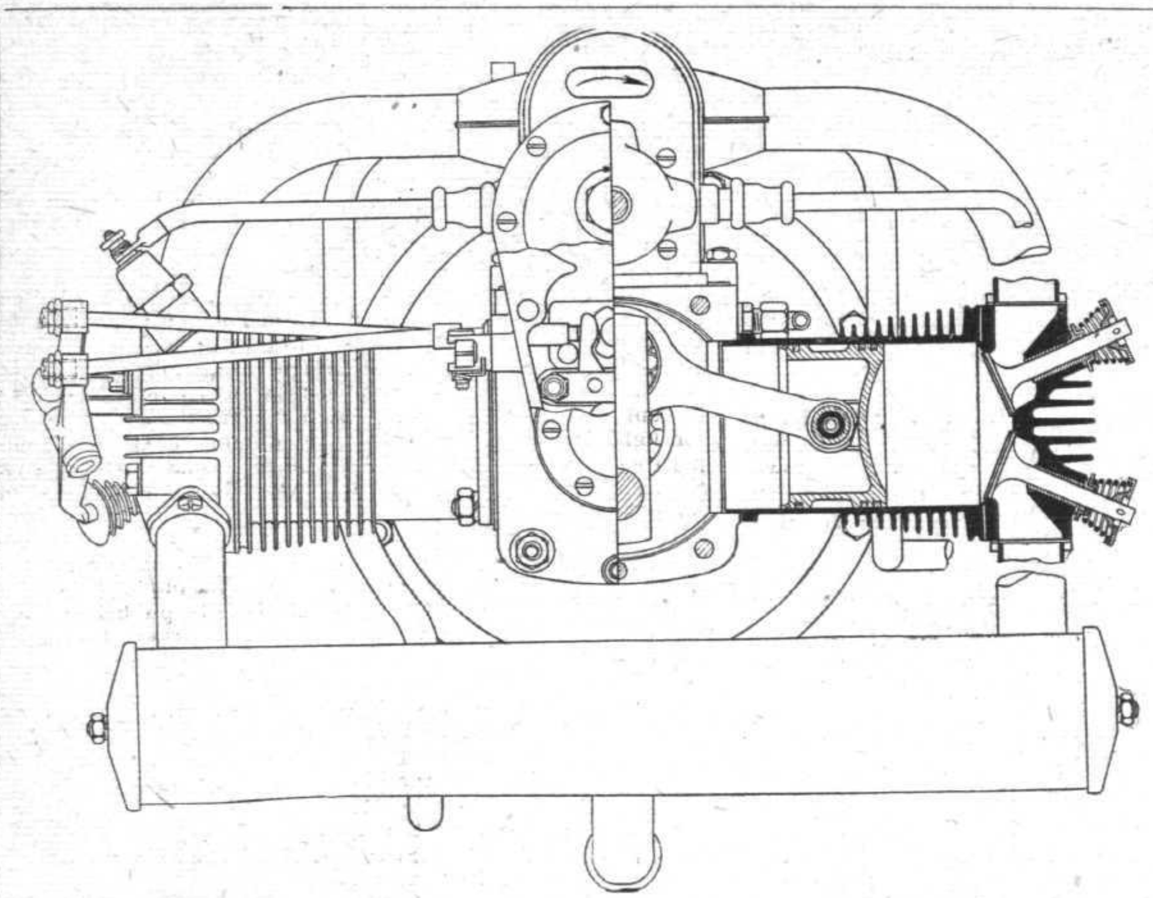
* * *

From the South Coast Land and Resort Co., Ltd., we learn that this company, proprietors of Peacehaven Garden city, between Newhaven and Brighton, has included in its development programme the establishment of an aerodrome on the Sussex Downs. Last summer, it may be remembered, Mijnheer Fokker made a few flights on the Peacehaven site, and the proprietors of this estate are now prepared to give all reasonable facilities to anyone who desires to practise gliding. We have no personal knowledge of the locality, but full particulars can be obtained from the proprietors, the South Coast Land and Resort Co., Ltd., Peacehaven Sussex.

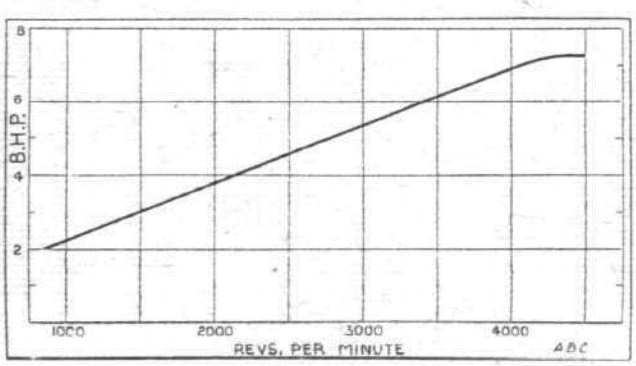
CYCLE ENGINES FOR LIGHT 'PLANES

In view of the limited engine capacity permitted by the rules governing the competition for the Duke of Sutherland's Prize of £500 (750 c.c.), it would appear that, unless engines are specially designed for this event, we shall have to look to the manufacturers of motor-cycle engines for our power plants. In a sense this is all to the good, as, if it can be proved that engines of this type are satisfactory for air work, it should be possible to purchase them at very reasonable figures owing to the fact that they are already being produced in large quantities for their original purpose, and thus should be about as cheap as it is possible to make them under present conditions. Moreover, the question of spares is greatly simplified, as these are, in the case of all the well-known makes of engines, readily obtainable, and at reasonable cost. We are not necessarily claiming that the cycle engine will be ideal for the purpose. As a matter of fact, it will probably be found to require alteration in certain respects, but even so the "faked" cycle engine should work out cheaper than an engine specially designed and for which there can at present be but a relatively limited demand. Later on there is little doubt that special engines will be produced in large quantities and at approximately the same prices as those now charged for motor-cycle engines. Thus one is forced to the conclusion that the pioneer work in connection with light 'planes will probably have to be done in the main by motor-cycle engines. We have therefore thought that a series of articles dealing with various cycle engines which appear suitable might be of considerable interest to our readers, and we shall attempt to give, whenever possible, the prices at which the various engines can be purchased, in order that our readers may be the better able to choose the engine which appears to give the best value for money, due consideration being, of course, given to its suitability in other respects. Such particulars as power curves on base of revolutions, petrol consumption, weight in running order, etc., will also be given when available, although we cannot promise to give all these for every engine, as it is not always possible to obtain them from the manufacturers.

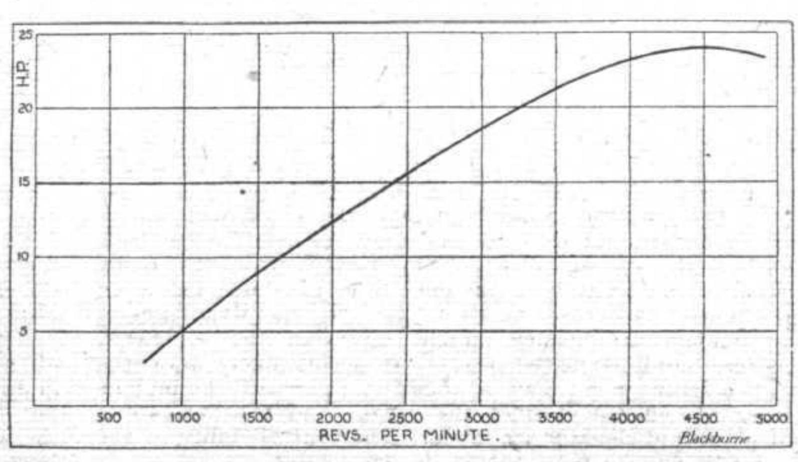
With reference to size of engine, we propose, for the present at any rate, to confine ourselves to such engines as fall within the limit of 750 c.c., as it seems likely that the majority of machines designed between now and September will be built with the Sutherland competition in view. Later on, when a few practical lessons have been learned, it may be found that 750 c.c. is a somewhat small capacity for a really practical machine, and slightly larger engines may then be dealt with.



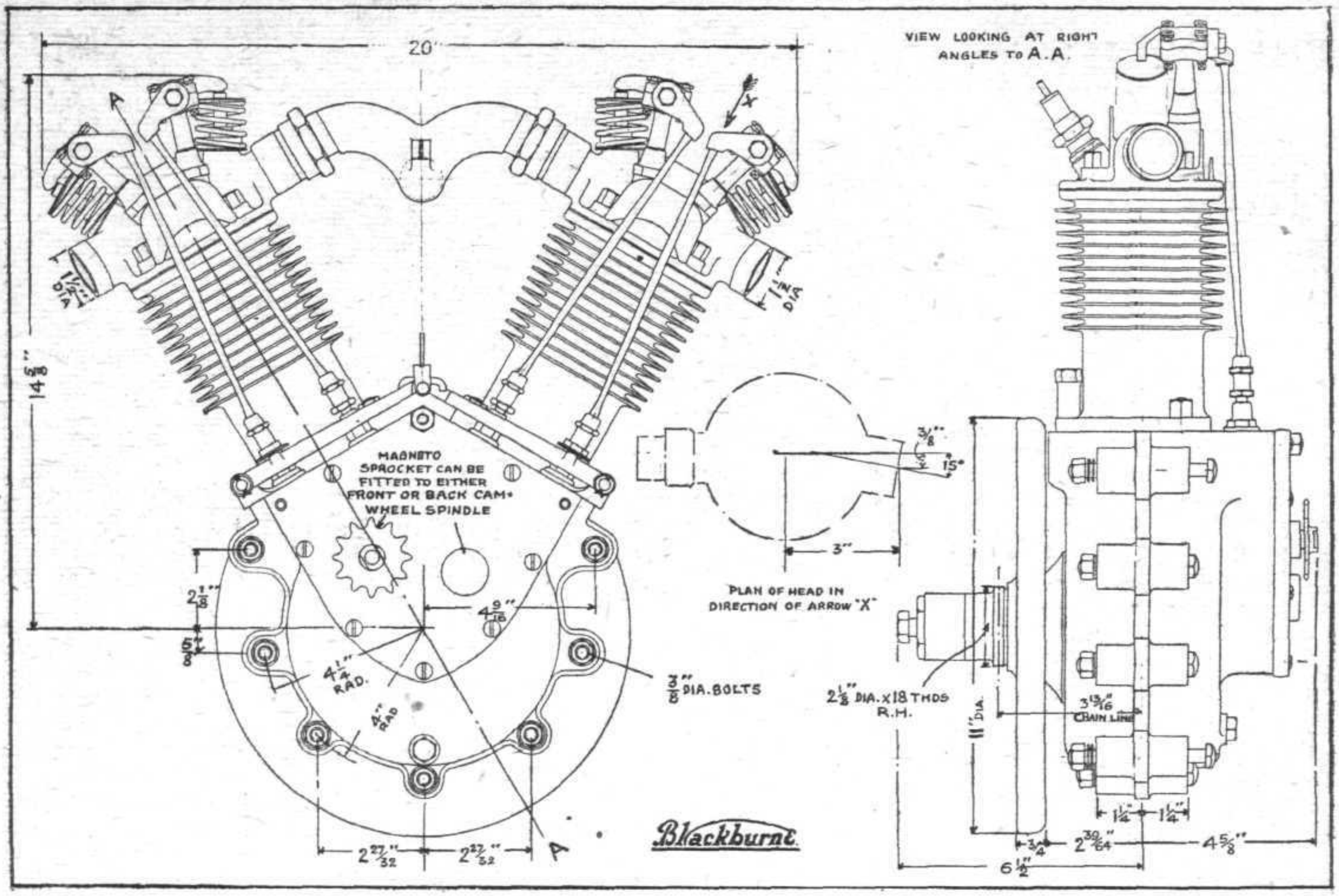
Part - sectional view of the 400 c.c. A.B.C. engine.



Power curve of 400 c.c. A.B.C. engine.



Power Curve of 5-6 h.p. Blackburne engine.



Two views of the 5–6 h.p. 697 c.c. overhead valve Blackburne engine

The A.B.C. 400 c.c. Flat Twin

As being probably the smallest engine likely to be of any practical use for light 'planes, and also because it is the first cycle engine to have proved itself capable of driving a man-carrying machine of modern type, it seems appropriate to commence our series of articles with a brief description of the A.B.C. 400 c.c. flat twin air-cooled, with which Sqdn.-Ldr. Maurice Wright made successful flights on the "Wren" designed by Mr. W. O. Manning for the English Electric Co., of Preston, Lancashire. A photograph of this machine was published in FLIGHT last week.

This engine was, of course, designed by Mr. Granville Bradshaw, and the engine and motor-cycle were built by the Sopwith Aviation and Engineering Co. until that firm ceased operations. A.B.C. Motors (1920), Ltd., of Walton-on-Thames, have not been building these small engines, having concentrated more upon the production of the larger engine fitted in the A.B.C. cars, and consequently it is not possible to quote prices, as these would depend upon the size of any probable order. It should, however, be possible to buy a few of the engines from agents or from private owners.

As the accompanying power curve will show, the A.B.C. 400 c.c. flat twin develops a maximum of somewhere between 7 and 8 h.p. at 4,500 r.p.m. In the case of the "Wren" the engine was not opened out fully, and that machine therefore flies with less than this, probably somewhere in the neighbourhood of 6 h.p. It will be seen, however, that the engine is of such small size that it probably represents approximately the minimum with which it is safe to fly, and in ordinary use would have to be running somewhat close to its maximum power, which might be rather hard on the engine. For the Sutherland Prize, however, the duration would probably not exceed three hours, and the engine should be able to stand up to 5 or 6 h.p. for that length of time. The petrol consumption is very low, the figure supplied us being 0·56 pint per b.h.p. per hour, or 2·8 pints per hour at 5 h.p. Thus one gallon should suffice for nearly three hours' flying. If we assume a speed of 37 m.p.h. with the engine developing 5 h.p., the distance covered (in still air, of course) would be approximately 100 miles. There is thus reason to believe that the winner of the Sutherland Prize will have to cover something like this distance, which is as good as a light solo machine obtains on the road.

The general arrangement of the A.B.C. flat twin is well shown in the accompanying drawing. The cylinders have a bore and stroke of 69 mm. by 54 mm. respectively. The cylinders are made with steel barrels, having the fins machined on them, and the detachable cylinder-heads are of cast iron. Overhead valves are used for efficiency, and the very low petrol consumption appears to indicate that this efficiency and economy have been attained. Complete with magneto and carburettor the engine weighs approximately 35 lbs., or less than 5 lbs./h.p. In the case of the "Wren" direct drive is used, which results in a propeller of very small diameter. The efficiency obtained with high revolutions and low forward speed is probably not particularly good (a rough estimate indicates about 70 per cent.), but the greater simplicity, the low ground clearance necessary (which reduces head resistance) and the lower weight may actually prove to give as good results as the geared-down airscrew of larger diameter.

The 5-6 h.p. Blackburne O.H.V. Engine

Manufactured by Burney and Blackburne, Ltd., Atlas Works, Bookham, Surrey, this engine is within the cylinder capacity stipulated for the Sutherland Prize, having a bore of 71 mm. and a stroke of 88 mm., giving a capacity of 697 c.c. The cylinders, which are set at an angle of 60 degrees, have detachable heads and are fitted with overhead valves. The power curve shows that the Blackburne will develop something like 24 h.p. at a speed of 4,500 r.p.m. As this power will certainly not be required except for getting off, it should be possible to fly with the engine throttled down to about 3,000 r.p.m., at which speed the power is about 18 h.p. For maximum economy it should even be possible to fly with the engine developing 15 h.p. (at 2,500), when the reliability should be very good. The weight of the standard engine is stated by the makers to be 64 lbs., which figure includes the weight of the standard large flywheel. It is thought that a smaller flywheel might be substituted, thus reducing the weight somewhat. Even with the standard equipment the weight is by no means prohibitive, however, and a few pounds extra would not make a great deal of difference in the performance of a machine. The petrol consumption is somewhat

high compared with aero-engine standards, being given by the makers as approximately 0·7 pint per b.h.p./hour.

The Blackburne has been running for two or three seasons now, and has been thoroughly tested in long-distance races on Brooklands track. We understand that it is then usual to run the engine at between 4,500 and 5,000 r.p.m., so that if this engine is normally run in an aircraft at about 2,500 to 3,000 r.p.m. it should be very reliable.

The accompanying drawings show the general arrangement, and indicate that the installation in a light 'plane should present no special difficulties. A couple of cradles of sheet steel, running transversely across the fuselage, should serve as bearers, and a chain drive with reduction gear could easily be incorporated. There is already a chain sprocket mounted on a 2½-inch diameter by 18 threads right-hand thread on the crankshaft, just outside the flywheel, and the propeller shaft, with thrust bearings, could probably be conveniently located between the cylinders. It might be useful to fit longer induction pipes, so as to bring the carburettor low down in order to give direct-gravity feed from the main tank. Otherwise the Blackburne engine does not appear to require any great alteration to make it suitable for a light 'plane. Apart from its large power for its size, the Blackburne should appeal on account of its low price, which is £29 17*s.* 6*d.* wholesale. The retail price would be somewhat higher, but even then should be an attractive proposition.

It might be objected that the V-type engine is not suitable for light 'planes owing to the imperfect balance. While theoretically there is cause for some doubt on this score, it should be possible to overcome most of the imperfections by retaining the standard flywheel so that the flywheel action of the propeller was not relied upon entirely for even running. Certain sources of vibration could scarcely be entirely eliminated, but only practical experience can show whether such are of a sufficiently serious nature to prevent the use of what appears otherwise to be a very suitable engine.

THE ROYAL AIR FORCE

London Gazette, April 10, 1923

General Duties Branch.

Flying Offr. S. E. Storrar is granted permanent commn. in rank stated; June 7, 1920, *Gazette* June 15, 1920, appointing him to short service commn., is cancelled. A. H. C. A. Rawson is granted short service commn. as Flying Offr., with effect from, and with seny. of, March 27.

The following Lieuts. are granted temp. commns. as Flying Offrs. on secdg. for four years' duty with R.A.F. :—G. E. F. Boyes, R.G.A.; April 3. C. A. Ravn, R. Welch Fus.; April 4. Squadn. Leader P. C. Sherren, M.C., is restored to full pay from half-pay; April 4. Flying Offr. H. J. Armitage is transferred to the Res., Cl. A; April 13. Flight-Lieut. P. G. N. Ommanney resigns his permanent commn.; April 4.

Reserve of Air Force Officers.

Class C.—P. G. N. Ommanney is granted a commn. in the General Duties Branch as Flight-Lieut.; April 4.

Nursing Service.

The follg. ladies are confirmed in their appts. as Staff Nurses :—Miss M. B. Morrison; July 1, 1922. Miss G. Inman, Miss E. J. Stuart, Miss E. K. Griffin; Sept. 1, 1922. Miss M. E. Hards, Miss B. Hamilton, Miss M. Manders, Miss D. J. E. Liddle; Sept 15, 1922.

Memorandum.

The permission granted to Lieut. G. J. Frost to retain his rank is withdrawn on his enlistment in the ranks; March 19.

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified :—

General Duties Branch.

Wing Commanders: H. L. Reilly, D.S.O., to No. 4 Flying Training School, Egypt. 6.4.23 to command.

Flight Lieutenants: R. H. C. Usher, M.C., A.F.C. to R.A.F. Depot. 16.4.23. G. T. Richardson to School of Photography, South Farnborough, for course of instruction. 23.4.23. G. M. Bryer, A.F.C. to R.A.F. Base, Gosport. 4.4.23. E. F. Turner to Headquarters Coastal Area. 3.4.23. C. V. A. Bucknall to R.A.F. Depot. 1.5.23. A. T. Williams to Headquarters R.A.F., Middle East, Egypt. 4.3.23. R. C. Hardstaff to No. 70 Squadron, Iraq. 5.3.23. N. B. Ward to No. 216 Squadron, Egypt. 23.3.23. G. H. Reid, D.F.C. to Inland Area Aircraft Depot, Henlow. 9.4.23.

Flying and Observer Officers: H. E. F. Saunders, O./Off. H. J. Collins and C. A. Ravn to No. 100 Squadron, Spittlegate. 4.4.23. E. C. Delamain, M.C. and O./Off. W. H. Dunton to School of Photography, South Farnborough. 23.4.23, for course of instruction. S. C. Black, M.M. to No. 12 Squadron, Northolt. 11.4.23. D. M. Fleming to No. 32 Squadron, Kenley. 18.4.23. E. C. Delamain: The posting of this officer to the School of Photography, South Farnborough, as notified in List No. 6, is hereby cancelled. B. H. C. Russell to No. 5 Squadron, India. 10.2.21. T. B. Bruce, M.C., to No. 8 Squadron, Iraq. 14.3.23. A. A. C. Hyde to School of Photography, South Farnborough. 23.4.23, for course of instruction. M. W. J. Boxall, D. C. H. Ferguson, A. E. G. Forrest, W. F. R. Gough, H. T. Herring, R. Jaques A. N. Macneal and R. H. Stewart Peter to No. 100 Squadron, Spittlegate. 3.4.23, for course of instruction. R. Kennedy to No. 100 Squadron, Spittlegate. 4.4.23, for course of instruction.

Pilot Officers: H. S. C. Bassett, L. P. Hirsh, P. J. A. Hume-Wright, G. Wake and J. B. Rose to R.A.F. Base, Gosport. 9.4.23. A. E. B. Bateman, S. H. G. Trower, M. Wiblin, J. B. Wilson and L. Young to Central Flying School, Upavon. 9.4.23. A. F. Scroggs to R.A.F. Base, Gosport. 18.4.23. A. W. B. Walker to No. 100 Squadron, Spittlegate. 9.4.23. L. G. A. Kirchner to R.A.F. Base, Calshot. 9.4.23.

Stores and Accountants Branch.

Flight Lieutenant A. E. Sutton-Jones to Stores Depot, Iraq. 14.9.22. Instead of to Headquarters, Iraq, as previously notified.

Flying Officers: L. J. Marden (Accountant) to Record Office, Ruislip. 26.4.23. W. H. Bowden to Stores Depot, Egypt. 4.3.23. F. W. Todd (Stores) to No. 5 Squadron, India. 12.3.23. C. W. Rugg (Stores) to No. 60 Squadron, India. 1.4.23.

Medical Branch.

Flight Lieutenant C. A. Meaden to Research Laboratory and Medical Officers' School of Instruction, Hampstead. 3.4.23.

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IN PARLIAMENT

Enemy Air Raid Compensation

MR. PONSONBY on April 11 asked the President of the Board of Trade whether, in the case of Mr. W. Shakespeare, of Princess Street, Sheffield, who has claimed compensation for the death of his wife and the destruction of his house in an air raid in September, 1916, he will say whether this claim has yet been examined, and for what reason no compensation has yet been received?

The Parliamentary Secretary to the Board of Trade: The answer to the first part of the question is in the affirmative. In regard to the latter part of the question, under the terms of the Treaty of Versailles no compensation is payable in cases of death where dependency did not exist. The Royal Commission has not yet rendered its Report in regard to property claims.

Lieut.-Col. Sir P. Richardson asked when the Reparation Claims Department will deal with claims in respect of damage sustained on land through enemy air raids in 1915?

Viscount Wolmer: Claims in respect of death and injury to persons are covered by the recent Report of the Royal Commission, and payment is now being made, and will shortly be completed. Property claims are now under consideration of the Royal Commission, but owing to their number and complexity some little time must elapse before their Report can be published.

Sir H. Brittain: What does "some little time" mean, as it has already taken eight years?

Viscount Wolmer: The hon. member is mistaken in thinking that it has taken the Royal Commission eight years. The Royal Commission was appointed little more than a year ago.

Royal Air Force Accidents

LIEUT.-COL. MOORE-BRABAZON asked the Secretary of State for Air whether his attention has been called to the two accidents at Shotwick on March 21 and 28; whether both the machines involved were re-conditioned war machines; and whether, in view of the risks involved in flying these machines, he is contemplating taking any steps in the matter?

Sir S. Hoare: I assume that my hon. and gallant friend is referring to the accidents that occurred on March 20 and 26. The cause of the first accident had no connection with the condition of the aeroplane; that of the second is still under investigation. In neither case was the aeroplane either re-conditioned or of pre-Armistice date, and consequently the last part of the question does not arise.

R.A.F. Bombing Attacks

MR. LANSBURY, on April 12, asked the Secretary of State for Air how many punitive expeditions have been undertaken by the Air Force during the year ending March 28 against tribesmen in India and Arabs and other nationals in Iraq and countries adjacent; how many casualties have been suffered by our airmen; how many persons of other nationalities have been killed or wounded; what damage has been inflicted on villages or towns; and will he state what bombs were used?

Lieut. Col. Sir Samuel Hoare: During the year ending March 28 last, bombing attacks were carried out in connection with the various military operations in Waziristan, but there were no independent punitive expeditions carried out by the Royal Air Force against tribes on the Indian frontier. In Iraq and Southern Kurdistan, where no military operations comparable with those undertaken in Waziristan have been carried out, there have been nine punitive air expeditions. The casualties to personnel of the Royal Air Force in these operations were in India, 3 officers and 1 airman killed, 2 officers and 1 airman injured; in Iraq, 3 officers killed and 1 injured. It is not possible to give particulars of the casualties sustained by the tribes against whom the operations were directed or of the extent of the material damage inflicted; it seems certain, however, that the use of air action in place of ground operations has resulted in a decrease in the loss of life incurred. The bombs used have been 230 lbs., 112 lbs. 20 lbs., and incendiary bombs.

I would remind the hon. member that upon the North-West frontier air operations form part of the general military operations against tribes with which the Government of India have been in a state of war, whereas in the case of Iraq punitive air expeditions are only undertaken at the request of the civil authorities in cases where ground expeditions would otherwise have been necessary.

POWER PLANTS FOR MODEL AEROPLANES

By A. F. HOULBERG

(*Continued from page* 205)

Compressed Air Motors

WE will deal with the engine unit first, and enumerate the desirable features for such an engine. It is necessary for it to be economical, light, well balanced, easily repaired and adjusted, and have a good torque diagram.

Considerations of economy call for accurate workmanship, high mechanical efficiency, and high volumetric efficiency. High mechanical efficiency is obtained by the use of the least possible number of cylinders, together with good workmanship, whilst high volumetric efficiency is obtained by efficient valve timing, short inlet pipes between the valves and the cylinders, and small clearance volume to the cylinders. There are four types of engine to choose from: the single cylinder, two cylinders opposed, the two-cylinder side by side and the radial. The single cylinder requires careful balancing with bob weights on the crankshaft, and in consequence loses on the ground of weight and ease of manufacture. Its torque diagram is also very bad. The two-cylinder opposed engine to be well balanced requires a two-throw crank, and suffers from an equally bad torque diagram, since the working strokes of the two cylinders are simultaneous. If, on the other hand, a single-throw crankshaft is used, the torque diagram is improved, as the working strokes of each cylinder occur alternately, but the balance is now no better than that of the single cylinder, while in both types of two-cylinder opposed engine it is difficult to arrange the valve so that the inlet pipes to the cylinder are short. The two-cylinder side by side seems to offer the best solution; its balance is good, its torque diagram is good, it is easy to arrange a single valve to feed the two cylinders with extremely short inlet passages, and it makes a very light and compact engine, although it requires a two-throw crankshaft. The radial engine has excellent balance and torque diagram, but suffers from the same difficulty as the two cylinders opposed where valves and inlet pipes are concerned; on the other hand, it is self-starting, a refinement which the other types lack. From the foregoing it is clear that of all the types, the two-cylinder side by side is the most desirable design to work on, particularly when one remembers that its nearest rival, the radial, loses further ground on the score of mechanical efficiency.

The most successful containers are cylindrical in shape and made of thin metal foil, having a thickness of from ·002 to ·004 of an inch, around which is wound steel wire of approximately 30 G in a spiral, with a pitch of from ¼ in. to ⅜ in. The ends are preferably spherical, and it is a distinct advantage to use a longitudinal tie-rod to take the end stresses, although it is often somewhat easier to use a few strands of 30 G wire running longitudinally along the exterior.

The formulæ necessary for obtaining the weights and volumes of cylindrical containers are :—

Volume of cylinder $= \pi R^2 L$; area of walls $= 2\pi RL$;

volume of sphere $= \frac{\pi}{6} D^3$; area of sphere $= \pi D^2$.

From these it will be seen that (ignoring the ends) the weight of a cylindrical container varies directly as the length and diameter, in other words, doubling the length doubles the weight, or doubling the diameter also doubles the weight. But while the volume also varies directly as the length, it varies as the square of the diameter, which means that when we double the length we double the volume, and by doubling the diameter we obtain four times the volume. From this it would appear that it is better to increase the diameter rather than the length when one desires to increase the capacity of a container, but before we can be definite on this point it is necessary to go into the question of relative strengths.

The ultimate pressure P which a cylindrical container can withstand is expressed by the formula :—

$P = \frac{KTF}{D}$ where P = pressure in lbs. sq. ins.; K = constant (7 for wire-bound containers); T = thickness of shell in ins.; F = tensile strength of walls; D = diameter of container in ins.;

therefore the strength varies inversely as the diameter, and taking three practical examples of containers of the same strength this is what we find :—

	Container No. 1.	Container No. 2. 2 length of 1	Container No. 3. 2 dia. of 1
Weight	1 lb.	1 lb. × 2	1 lb. × 2 × 2
Volume	1 cu. ft.	1 cu. ft. × 2	1 cu. ft. × 2^2

From which we see that there is no advantage in making containers of large diameter, as the advantages gained in volume is counteracted by the stouter material required to give the container the same working pressure.

It occurred to me that it might be of advantage to restore to the air some of the heat lost in the process of compression. Two reasons prompted me in this, the first being the more economical use which could be made of the air owing to the greater expansion of the air on leaving the container, and the second the elimination of the rather annoying freezing which is encountered during the cold weather. If the air is reheated before passing into the motor, the available work is increased in the ratio of the absolute temperature before and after reheating. For example, if the absolute temperature before reheating is 520°, and after reheating 780°, then the available work will be $\frac{780}{520} = 1 \cdot 5$ times what it was before reheating. (To obtain absolute temperature, add 273 to reading on the Centigrade scale and 460 on the Fahrenheit scale.) The temperature at which compressed air plants work is from 0° to 20° C., depending on the weather conditions. This gives an absolute temperature (using the larger figure) of 293°. Now, by reheating the air to 100° C., or 373° absolute, the amount of work available is increased to $\frac{373}{293} = 1 \cdot 27$ times the original quantity, so that, if we reheat the air to the temperature of boiling water we increase the duration of a model whose normal duration is 60 secs. to $60 \times 1 \cdot 27 =$ 76 secs., an increase of 26·6 per cent.

Now let us see what we have to do to double the duration. Our absolute temperature before reheating is 293°, so our new temperature will have to be $(293 \times 2) - 273 = 313°$ C., or well above the melting point of solder, which causes us to abandon such details as leather washers and soft soldering, and bring our engines in line with steam practice.

Errata

In last week's issue the weight of water and of CO_2 was referred to in lbs. per sq. ft. This, of course, should have read "cu. ft."

(*To be concluded.*)

Royal Air Force Club

Annual General Meeting.—The Annual General Meeting of the Royal Air Force Club will take place at 5.30 p.m., on Monday, April, 30, 1923.

R.A.F. Irish Wing Dinner

THE Second Annual Dinner of the 11th Irish Wing will be held in the Hotel Cecil, Strand, on Friday, May 11th, 7.30 for 8 p.m. Dress, dinner jackets. Will officers desirous of attending please communicate with Sqn.-Lr. C. J. Mackay, Air Ministry, Kingsway, W.C. 2.

New U.S. Night Air Mail 'Planes

ACCORDING to *Aviation*, plans for the night flying of the Air Mail service have now progressed to the point of warranting the U.S. Post Office Department ordering new experimental aeroplanes for this work. The emergency landing fields on the Chicago-Cheyenne section of the transcontinental mail airway—where night flying is to be tried out—have been selected for the first trials. What the characteristics of the new machines will be have not as yet been disclosed.

German Aeroplane Accident

ON April 14 a serious accident occurred to a German aeroplane piloted by Herr Noack, which resulted in the death of three passengers. A flying meeting was being held to celebrate the opening of the old parade ground Tempelhofer Feld as a civilian aerodrome, and several German constructors had sent machines to give demonstrations. The machine piloted by Noack was, it is stated, a reconditioned war machine belonging to the Deutsche Luft Reederei, and it appears that it was the old story of engine failure near the ground, an attempt to turn back into the aerodrome, a stall, and the crash. The three passengers were members of the Berlin municipal administration, two of them—Mezynski and Vogt—being killed instantly, while the third, Councillor Bötzer, succumbed to his injuries next day. The pilot was severely but not fatally injured.

R.A.F. MEMORIAL FUND.

A MEETING of the Executive Committee was held at the offices, No. 7, Iddesleigh House, Caxton Street, on March 28. There were present:—

Lord Hugh Cecil (in the Chair), Lady Leighton, Dame Helen Gwynne-Vaughan, Mrs. Barrington-Kennett, Mrs. L. M. K. Pratt-Barlow, Sir Charles McLeod, Air Vice-Marshal J. F. A. Higgins, Group-Captain E. R. Ludlow-Hewitt, Lieut.-Commander H. E. Perrin.

The accounts for 1922, as laid before the meeting, were approved. In this connection the Committee were gratified to be able to acknowledge receipt from the Air Council of the sum of £2,098 16*s.* 11*d.*, being net proceeds of the R.A.F. Aerial Pageant held at Hendon in June, 1922, together with a sum of £1,000, which was returned to the Memorial Fund by the Air Council, and which represented the amount set aside out of the proceeds of the Air Pageant 1921 for the Pageant of 1922, the Air Council notifying, at the same time, that they are retaining for a similar purpose for 1923 the sum of £1,000.

It was announced that Group-Captain H.R.H. the Prince of Wales, K.G., had kindly consented to perform the ceremony of unveiling the R.A.F. War Memorial on the Thames Embankment on Monday, July 16 next, and that Group-Captain H.R.H. the Duke of York, K.G., President of the Fund, had also signified his intention of being present.

It was also stated that the second house at Ascot, very kindly presented to the Fund by Mrs. Salting, has been sold, and that the proceeds of the sale will shortly be handed over to the Committee, when a formal scheme for the purchase of scholarships or bursaries, or the grant of educational allowances for the children of R.A.F. officers, past and present (with special reference to orphans whose fathers died during the War), will be set on foot, although no actual grants under this head can be made until a year has elapsed and one year's interest on the invested funds is available.

With regard to grants to the distressed, both officers, men and their dependents, ex-R.A.F., the number of cases dealt with in the interval between the last meeting, on February 28, and the meeting under report is 90, and the amount disbursed is £365, which includes the monthly reimbursement towards the grants and loans made to ex-officers, R.A.F., by the Officers' Benevolent Branch of the British Legion, better known as the Officers' Association.

The next meeting of the Executive Committee was fixed for May 9, at the offices of the Fund.

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REPORT OF THE SOCIETY OF MODEL AERONAUTICAL ENGINEERS

GUSTY and unsettled, the weather prevented a large attendance at Wimbledon Common on April 14, when the S.M.A.E. had arranged a meeting to attempt to improve some of the British model aeroplane records, but four members, Messrs. Johnson, Green, Cooke and Pavely, turned up to try their luck. The two former, flying rubber-driven models, found the wind rather too much for them, and as Mr. Cooke had trouble with the valve of his compressed-air machine's container, Mr. Pavely had things more or less his own way. Accordingly, after a few preliminary trials, the latter set out to make a really serious effort, and put up a very fine performance of 39⅗ secs., thereby winning the "Major C. C. Turner Record Cup for Enclosed Fuselage Models" from the previous holder, Mr. L. A. Gray. Mr. Pavely, by the way, was flying the compressed-air driven monoplane with which he won the "Pilcher Cup" last month.

On Sunday, the 15th, there was a practice meeting on Parliament Hill, and Messrs. Howes, Whelpton, Davis and others were doing some very good gliding. Mr. Gray, after showing that his enclosed rubber-driven model had a very good ceiling, tried a little gliding, and seemed to be taking it very seriously. Perhaps he has got his eye on the Glider Cup. Mr. Burchell turned up without a model, but appeared to satisfactorily while away the time by amusing himself with Mr. Gray's model.

A gliding competition will be held on Parliament Hill at 11 a.m. on Sunday, April 22. On the 25th there will be a Council Meeting at Headquarters at 8 p.m.

April 28 is fixed as the date for the next round of the "D. H. Pilcher" Challenge Cup Competition, the meeting to be at 3.30 p.m. at Wanstead Flats.

On Friday next, the 20th, there will be the usual little social gathering at 7.30 p.m. at 20, Great Windmill Street, Piccadilly. Visitors, come right along, please.

A. E. JONES, Hon. Sec.

PUBLICATIONS RECEIVED.

Circular of the Bureau of Standards. No. 121. Construction and Operation of a Two-Circuit Radio Receiving Equipment with Crystal Detector. July 17, 1922. Government Printing Office, Washington, D.C., U.S.A. Price 5 cents.

Technologic Papers of the Bureau of Standards. No. 216. Properties of Electrical Insulating Materials of the Laminated Phenolmethylene Type. By J. H. Dellinger and J. L. Preston. July 21, 1922. Government Printing Office, Washington, D.C., U.S.A. Price 30 cents.

Scientific Papers of the Bureau of Standards. No. 455. Tables for the Calculation of the Inductance of Circular Coils of Rectangular Cross Section. By Frederick W. Grover. October 28, 1922. Government Printing Office, D.C., U.S.A. Price 10 cents.

The Real Mesopotamia. By "Harun." The Modern Printing Company, 238-240, Stretford Road, Hulme, Manchester.

Atti dell' Associazione Italiana di Aerotecnica, 1923. *Vol. III—No.* 1 Atti dell' Associazione Italiana di Aerotecnica, Lungotevere Michelangelo, 10, Rome. Price, Lire 15.

Eighth Annual Report of the National Advisory Committee for Aeronautics, 1922. National Advisory Committee for Aeronautics, Washington, D.C., U.S.A.

Report No. 136. Damping Coefficients Due to Tail Surface in Aircraft.

Report No. 143. Analysis of Stresses in German Airplanes. By W. Hoff. National Advisory Committee for Aeronautics, Washington, D.C., U.S.A.

No. 156, The Altitude Effect on Air Speed Indicators: II. By H. N. Eaton and W. A. MacNair. No. 151, General Biplane Theory. By Max M. Munk. National Advisory Committee for Aeronautics, Washington, D.C., U.S.A.

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AERONAUTICAL PATENT SPECIFICATIONS

Abbreviations: cyl. = cylinder; I.C. = internal combustion; m. = motor
The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

APPLIED FOR IN 1921
Published April 19, 1923

27,865. G. W. and H. E. JOHNS. Construction of airships. (195,110.)

APPLIED FOR IN 1922
Published April 19, 1923

4,690. H. O. SHORT. Wing construction. (195,235.)
9,633. H. O. and A. E. SHORT and O. T. GNOSSPELIUS. Means for lifting liquid fuel. (195,277.)
15,982. SIEMENS-SCHUCKERTWERKE GES. Clutches. (195,307.)

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